

The Roles of Teaching Hospitals, Insurance Status, and Race/Ethnicity in Receipt of Adjuvant Therapy for Regional-Stage Breast Cancer in Florida

Lisa C. Richardson, MD, MPH, Lili Tian, PhD, Lydia Voti, MS, Abraham G. Hartzema, PharmD, MSPH, PhD, Isildinha Reis, DrPH, Lora E. Fleming, MD, MPH, PhD, and Jill MacKinnon, BA

Lymph node status is the most powerful prognostic factor predicting relapse and survival among breast cancer patients. For patients with *regional-stage breast cancer*, in which cancer cells are found in the lymph nodes or within the breast tissue itself (outside the primary tumor), *adjuvant therapy*—given after initial treatment of the cancer with surgery and radiation—is considered standard treatment.^{1–3} Adjuvant therapy has a systemic effect and may consist of intravenous chemotherapy only, hormonal therapy only, or a combination of the 2.⁴ Practice-based studies have shown that in some cases less than optimal therapy is being delivered, which may lead to poorer outcomes. These studies have been single-institution studies^{5,6} or have used data sets limited to women older than 65 years^{7,8} and thus the results may not be generalizable to all women treated for breast cancer.

Many factors have been shown to predict use of chemotherapy in regional-stage breast cancer, including age,^{7–9} race/ethnicity,^{7,10} and socioeconomic factors (education, income, and health insurance status).^{5,11,12} Some studies indicate that African American women are more likely than White women to undergo chemotherapy, but these differences disappear after control for breast cancer stage.^{7,12} In a study of women diagnosed with breast cancer in the Metropolitan Detroit area, Bradley and colleagues found that women insured by Medicaid (a proxy measure for lower socioeconomic status) were less likely to receive appropriate treatment than women with other types of insurance, regardless of their race/ethnicity.¹³ Other researchers have reported that race/ethnicity^{11,14} and type of health insurance^{5,11} predict breast cancer treatment as well. Defining the separate roles of race/ethnicity and socioeconomic status in breast cancer treatment and survival

has proven very difficult, because minority women tend to have lower incomes and lower educational attainment than do White women, and they are also less likely to have health insurance.^{15,16}

Health insurance plays a critical role in access to medical care. Health care for the uninsured and those insured by Medicaid has become more challenging as more health care providers no longer accept these patients.^{17–19} Safety-net providers exist for primary care, but uninsured and Medicaid-insured patients' access to expensive specialty care is limited.^{15,17} For such patients, teaching hospitals are safety-net care providers.

Our preliminary analyses of Florida Cancer Data System (FCDS) data from July 1997 through December 2000 revealed that uninsured women and those insured by Medicaid were more likely than women with private insurance to receive adjuvant therapy for

regional-stage breast cancer.²⁰ In an effort to explain these findings, we asked the following questions: What is the role of teaching hospitals in providing care for regional-stage breast cancers? How did the receipt of adjuvant therapy for regional-stage breast cancers differ by race/ethnicity and insurance status among the women in our study?

METHODS

Data Source and Study Population

The FCDS, Florida's statewide population-based tumor incident cancer registry, is a member of the North American Association of Central Cancer Registries (NAACCR).²¹ All newly diagnosed cancers in Florida are reported to FCDS, following data collection standards set by NAACCR, the American College of Surgeons, and the National Program for Cancer Registries. Past audits conducted

Objectives. We examined the roles of teaching hospitals, insurance status, and race/ethnicity in women's receipt of adjuvant therapy for regional-stage breast cancer.

Methods. Data were taken from the Florida Cancer Data System for cases diagnosed from July 1997 to December 2000. We evaluated the impact of health insurance status and hospital type on use of adjuvant therapy (after adjustment for age, race/ethnicity, and marital status). Interaction terms for hospital type, insurance status, and race/ethnicity were entered in each model.

Results. Teaching facilities diagnosed 12.5% of the cases; however, they cared for a disproportionate percentage (21.3%) of uninsured and Medicaid-insured women. Among women who received adjuvant chemotherapy only, those diagnosed in teaching hospitals were more likely than those diagnosed in nonteaching hospitals to receive therapy regardless of insurance status or race/ethnicity. Among women who received chemotherapy with or without hormonal therapy, Hispanics were more likely than White non-Hispanic women to receive therapy, whereas women with private insurance or Medicare were less likely than uninsured and Medicaid-insured women to receive this type of therapy.

Conclusions. Teaching facilities play an important role in the diagnosis and treatment of regional-stage breast cancer among Hispanics, uninsured women, and women insured by Medicaid. (*Am J Public Health.* 2006;96:160–166. doi:10.2105/AJPH.2004.053579)

by NAACCR, using the incidence-to-mortality ratio method, have estimated case reporting to be 99.4% complete.²²

The population eligible for this study consisted of 11 175 women with primary cases of regional-stage breast cancer (defined, according to Surveillance and End Results Registry [SEER] summary stage classification, as breast cancers that extend directly from the breast and breast cancers in which the lymph nodes are positive²³) diagnosed between July 1, 1997, and December 31, 2000. Lymph nodes were positive in more than 90% of the cases. FCDS collects data on all cancer-directed treatment administered in the first 4 to 12 months of a breast cancer diagnosis. All treatment modalities are included, regardless of sequence, degree of completeness, and whether treatment was performed at the reporting hospital or elsewhere.²¹

Definitions

FCDS codes chemotherapy as follows: 0=no chemotherapy; 1=chemotherapy, not otherwise specified; 2=chemotherapy, single agent; 3=chemotherapy, multiple agents (combination regimen); 7=patient or patient's guardian refused chemotherapy; 8=chemotherapy recommended, unknown whether administered; 9=unknown whether chemotherapy administered. Hormonal therapy (including oral medications such as tamoxifen) is coded similarly: 0=no hormonal therapy; 1=hormonal therapy (including hormonal therapy not otherwise specified and therapy with antihormones); 2=endocrine surgery (surgical removal of the ovaries); 3=combination of 1 and 2; 7=patient or patient's guardian refused hormonal therapy; 8=hormonal therapy recommended, unknown whether administered; and 9=unknown.

To examine "adjuvant treatment received" versus "no adjuvant treatment received," we created 2 dichotomous outcome variables: (1) adjuvant therapy with chemotherapy alone and (2) "any adjuvant therapy," which includes chemotherapy alone, hormonal therapy alone, or the 2 therapies together. Like other researchers,^{10,24} we recoded the FCDS codes 1, 2, 3, and 8 as "therapy received"; we recoded 0 and 7 as "no therapy received"; and we coded 9 as "unknown."

More than 95% of the women in our data set received all or a portion of their therapy at the reporting hospital (the hospital that reported the case to the state cancer registry). The reporting hospital was usually the hospital where the case was diagnosed. For the sake of simplicity, we use the terms "diagnosed in," "treated in," and "reported from" interchangeably.

Data Analysis

Age at diagnosis was employed as a continuous variable. Race and ethnicity were combined into a race/ethnicity variable and cases were assigned to mutually exclusive categories: White non-Hispanic, Black non-Hispanic, and Hispanic. Because of the small number of American Indian/Alaska Native and Asian and Pacific Islander cases ($n=64$), these cases were excluded.

Health insurance status was collapsed into 5 categories: uninsured (including uninsured and self-paying), privately insured (including private insurance; managed care; insured, type unknown; and CHAMPUS and military), Medicare-insured (including Medicare, Veterans Affairs, Indian Health Service, and Public Health Service), Medicaid-insured (Medicaid and welfare), and unknown. The 139 women insured by CHAMPUS and military insurance were included with the privately insured because these insurance types reimbursed providers on a fee-for-service basis. Marital status was defined as single (never married or marriage annulled), married (including common-law marriages), separated or divorced, widowed, and unknown.

We categorized reporting facilities into 2 broad categories: American Association of Medical College (AAMC)-recognized training programs versus all other facilities. AAMC is a nonprofit organization representing the nation's 125 accredited medical schools and nearly 400 major hospital-based teaching programs.²⁵ There are 8 AAMC-recognized teaching hospitals (3 accredited medical schools and 5 major hospital-based programs) and 197 nonteaching hospitals in Florida.

We fitted 2 multivariate logistic regression models to estimate the odds of a patient's receiving adjuvant therapy versus not receiving adjuvant therapy. The model included the following covariates: age at diagnosis, race/

ethnicity, marital status, health insurance status, and type of hospital (teaching vs nonteaching).

Interaction terms between insurance status and marital status; race/ethnicity and teaching hospital; and teaching hospital and health insurance were tested for both outcomes. Interaction terms were included in the final model if they were statistically significant at the 5% level. We estimated odds ratios (ORs) with corresponding 95% confidence intervals (CIs); ORs were considered significant if the corresponding 95% CI did not include 1.0. We used SAS statistical software, version 9.0 (SAS Institute Inc, Cary, NC), for data analysis.

RESULTS

Cases were excluded from the analysis if there were missing variables for the covariates or treatment outcomes. For receipt of chemotherapy only, the final analytic model included 10 052 cases; for combined therapy, the final analytic model included 10 048 cases.

The demographic, insurance, and treatment characteristics of the study population are shown in Table 1. Mean age at diagnosis was 61 years (range, 21–104 years). Hispanic women and Black non-Hispanic women accounted for approximately 20% of the study population. Five percent of the study population were uninsured, 51.8% had private insurance, 36.3% were covered by federal insurance (Medicare), and 3.4% were covered by state-sponsored insurance (Medicaid). Approximately 12.5% of the cases were diagnosed in teaching hospitals. Approximately 50% were treated with chemotherapy only and 57% with combined therapy within the first 4 to 12 months after diagnosis.

Women reported from teaching hospitals were on average 5.1 years younger than women reported from nonteaching hospitals (mean age at diagnosis=56.7 years vs 61.8 years; $P=.0001$). They were also more likely to be members of ethnic minority groups; 30.4% of the women treated in teaching hospitals were Hispanic or Black non-Hispanic, compared with 17.8% of the women treated in nonteaching hospitals. The 8 Florida teaching hospitals (which constitute 4% of the 205 hospitals in

TABLE 1—Characteristics of Women With Regional-Stage Breast Cancer, by Hospital Type: Florida, July 1, 1997–December 31, 2000

	Teaching Hospital	Nonteaching Hospital	Total
Cases, no. (%)	1397 (12.5)	9778 (87.5)	11 175
(100)			
Age at diagnosis, y			
Mean (SD)	56.7 (13.5)	61.8 (14.5)	61.2 (14.5)
Range	21–104	25–95	21–104
Race/ethnicity, no. (%)			
White non-Hispanic	946 (67.7)	7909 (80.9)	8855 (79.2)
Black non-Hispanic	211 (15.1)	881 (9.0)	1092 (9.8)
Hispanic	214 (15.3)	862 (8.8)	1076 (9.6)
American Indian/Alaska Native	1 (0.1)	3 (0.0)	4 (0.0)
Asian/Pacific Islander	15 (1.1)	45 (0.5)	60 (0.5)
Unknown	10 (0.7)	78 (0.8)	88 (0.8)
Marital status, no. (%)			
Single	205 (14.7)	1047 (10.7)	1252 (11.2)
Married	746 (53.4)	5392 (55.1)	6138 (54.9)
Separated/divorced	225 (16.1)	1025 (10.5)	1250 (11.2)
Widowed	182 (13.0)	1982 (20.3)	2164 (19.4)
Unknown	39 (2.8)	332 (3.4)	371 (3.3)
Health insurance status, no. (%)			
Uninsured	177 (12.7)	383 (3.9)	560 (5.0)
Privately insured	720 (51.5)	5065 (51.8)	5785 (51.8)
Medicare	373 (26.7)	3682 (37.7)	4055 (36.3)
Medicaid	120 (8.6)	261 (2.7)	381 (3.4)
Unknown	7 (0.5)	387 (4.0)	394 (3.5)
Chemotherapy, ^a no. (%)			
Yes	946 (67.7)	4592 (47.0)	5538 (49.6)
No	442 (31.6)	4928 (50.4)	5370 (48.1)
Unknown	9 (0.6)	258 (2.6)	267 (2.4)
Hormonal therapy, ^a no. (%)			
Yes	341 (24.4)	1439 (14.7)	1780 (15.9)
No	1052 (75.3)	8130 (83.1)	9182 (82.2)
Unknown	4 (0.3)	209 (2.1)	213 (1.9)
Any adjuvant therapy, ^b no. (%)			
Yes	1099 (78.7)	5276 (54.0)	6375 (57.0)
No	290 (20.8)	4238 (43.3)	4528 (40.5)
Unknown	8 (0.6)	264 (2.7)	272 (2.4)

Note. All differences between teaching facilities and nonteaching facilities were significant with $P < .001$.

^aFor chemotherapy and hormonal therapy, the category coded recommended but unknown if given was coded as received.

Exclusion of these cases did not change our results.

^b"Any adjuvant therapy" includes chemotherapy alone, hormonal therapy alone, or the 2 therapies together.

chemotherapy; with each 1-year increase in age, starting at age 50, the odds of receiving chemotherapy decreased by 5% (OR=0.95, 95% CI=0.95, 0.96; Table 2). Marital status remained significant in the presence of other factors, with married women and separated or divorced women approximately 33% to 34% more likely than single women to receive chemotherapy.

The model for estimating the odds of receiving chemotherapy included 2 significant interactions: race/ethnicity×hospital type ($P=.047$) and health insurance×hospital type ($P=.003$; Table 2). Race/ethnicity was a significant predictor of receipt of chemotherapy, with differing effects within teaching and nonteaching facilities. In nonteaching facilities, Black non-Hispanic and White non-Hispanic women had similar odds of receiving chemotherapy (OR=0.98; 95% CI=0.82, 1.18), whereas Hispanic women had 40% lower odds than White non-Hispanic women. In teaching facilities, Hispanic women and White non-Hispanic women were equally likely to receive chemotherapy (OR=0.96; 95% CI=0.60, 1.54); Black non-Hispanic women were less likely than White women to receive chemotherapy, though the difference was not statistically significant (OR=0.75; 95% CI=0.49, 1.16).

Health insurance coverage affected the odds of receiving chemotherapy by hospital type. In teaching facilities, the odds of receiving chemotherapy for women insured by private insurance, Medicare, or Medicaid did not statistically differ from the odds for uninsured women (Table 2). However, although the difference was not statistically significant, Medicare-insured women had lower odds (OR=0.60; 95% CI=0.35, 1.03) of receiving chemotherapy than uninsured women, and Medicaid-insured women had twice the odds (OR=2.08; 95% CI=0.99, 4.40) of receiving chemotherapy compared with uninsured women. In nonteaching facilities, women insured by Medicaid had lower odds of receiving chemotherapy than uninsured women, although the difference was not statistically significant (OR=0.73; 95% CI=0.48, 1.09); privately insured women and women insured by Medicare were almost 30% less likely than uninsured women to receive chemotherapy.

Florida) diagnosed more than 30% of the uninsured and Medicaid-insured cases during the study period. A much higher percentage of patients reported from teaching facilities than patients reported from nonteaching facilities received adjuvant therapy

(chemotherapy alone, 67.7% vs 47.0%; any adjuvant therapy, 78.7% vs 54%).

Next we modeled the odds of receiving chemotherapy alone, accounting for the covariates shown in Table 1. Age at diagnosis was the most significant predictor of receiving

TABLE 2—Estimated Odds of Receiving Chemotherapy Alone: Women With Regional-Stage Breast Cancer, Florida, July 1, 1997–December 31, 2000 (n = 10 052)

	No. of Cases ^a	% Receiving Chemotherapy	OR (95% CI) ^b
Age at diagnosis, per 1-y increase	0.95 (0.95, 0.96)
Marital status			
Single	1177	55.3	1.0
Married	5698	56.1	1.33 (1.14, 1.56)
Separated/divorced	1162	60.2	1.34 (1.10, 1.64)
Widowed	2015	28.2	0.87 (0.71, 1.05)
Insurance status within hospital type			
Nonteaching hospital			
Uninsured	352	67.1	1.0
Privately insured	4,710	57.2	0.71 (0.54, 0.94)
Medicare	3,442	33.6	0.73 (0.54, 0.97)
Medicaid	231	58.0	0.73 (0.48, 1.09)
Teaching hospital			
Uninsured	164	74.4	1.0
Privately insured	678	75.8	0.92 (0.55, 1.54)
Medicare	357	43.7	0.60 (0.35, 1.03)
Medicaid	118	87.3	2.08 (0.99, 4.40)
Race/ethnicity within hospital type			
Nonteaching hospital			
White non-Hispanic	7,136	48.3	1.0
Black non-Hispanic	801	55.6	0.98 (0.82, 1.18)
Hispanic	798	42.5	0.60 (0.50, 0.72)
Teaching hospital			
White non-Hispanic	911	66.1	1.0
Black non-Hispanic	200	68.0	0.75 (0.49, 1.16)
Hispanic	206	76.2	0.96 (0.60, 1.54)

Note. OR = odds ratio; CI = confidence interval.

^aCases for which data on any study variable was missing were excluded from this analysis (n = 1123; see Methods).

^bOR estimates are based on the logistic regression model, which includes age, marital status, health insurance status, race/ethnicity, hospital type race/ethnicity ($P = .047$), and hospital type health insurance status ($P = .003$). ORs are considered significant if the 95% CI does not include 1.0.

Next we examined receipt of “any adjuvant therapy” (chemotherapy alone or with hormonal therapy; Table 3). In comparison to the logistic model for receipt for chemotherapy alone, only 1 interaction term (race/ethnicity \times hospital type) was significant ($P = .01$). The odds of receiving combined therapy decreased by 3% with each 1-year increase in age (OR = 0.97; 95% CI = 0.9, 0.98). Marital status remained significant in the overall model: married, separated, or divorced women were 32% more likely than single women to receive “any adjuvant therapy.” Health insurance status remained a significant predictor of receipt of any adjuvant

therapy: women insured by private insurance or Medicare were less likely than uninsured women to receive therapy (OR = 0.71; 95% CI = 0.56, 0.90 vs OR = 0.74; 95% CI = 0.57, 0.96).

For receipt of “any adjuvant therapy,” race/ethnicity had a differing influence on outcome by hospital type: within nonteaching facilities, Hispanic women were 42% less likely than White non-Hispanic women to receive therapy; Black non-Hispanic women were as likely as White non-Hispanic women to receive therapy (OR = 0.99; 95% CI = 0.83, 1.18). In teaching hospitals, Black non-Hispanic women were 42% less likely than

White non-Hispanic women to receive therapy; Hispanic women were less likely than White non-Hispanic women to receive therapy, but this difference was not statistically significant (OR = 0.81; 95% CI = 0.52–1.28).

DISCUSSION

Health insurance status plays a key role in access to health care services.²⁶ Recent studies of breast cancer treatment have found that uninsured Americans have less access to medical care and are less likely to receive appropriate care once they have gained access to the health care system.^{5,11,12,27} Among the medically underserved, teaching hospitals play a critical role in providing state-of-the-art services.^{28,29} The impact of teaching hospitals on breast cancer treatment outcomes has not been studied in a systematic way.^{5,30–32} In our study, 30% of uninsured and Medicaid-insured women were diagnosed in teaching hospitals, 3 of which are public hospitals. This situation is not unique to Florida. A recent Commonwealth Fund report indicated that approximately 30% of charity care in communities that have public academic health centers is provided by those hospitals, whereas 13% is provided by privately owned academic health centers.²⁸

We found that among women whose regional-stage breast cancer was diagnosed in teaching hospitals, Medicaid-insured and uninsured women had the highest likelihood of receiving chemotherapy. Women covered by private insurance or Medicare were less likely to receive chemotherapy in this setting. For combined systemic therapy, health insurance remained significant in the overall model predicting receipt of treatment, with Medicaid-insured women and uninsured women receiving similar treatment. Osteen and colleagues³³ reported similar findings; however, they did not control for possible confounders of the relationship between chemotherapy use and teaching hospitals. Other investigators have reported results contrary to ours, finding privately insured women more likely than uninsured women or those covered by state-sponsored health insurance to receive chemotherapy.^{5,31,32}

We also found that treatment differed for different racial/ethnic groups depending on

TABLE 3—Estimated Odds of Receiving Any Adjuvant Therapy: Women With Regional-Stage Breast Cancer, Florida, July 1, 1997–December 31, 2000 (n = 10 048)

	No. of Cases ^a	% Receiving Any Adjuvant Therapy ^b	OR (95% CI) ^c
Age at diagnosis, per 1-y increase			0.97 (0.97, 0.98)
Marital status			
Single	1176	59.5	1.0
Married	5699	62.2	1.32 (1.13, 1.54)
Separated/divorced	1162	65.0	1.32 (1.09, 1.60)
Widowed	2011	44.5	1.01 (0.84, 1.21)
Health insurance status			
Uninsured	516	73.3	1.0
Private	5388	63.1	0.71 (0.56, 0.90)
Medicare	3795	49.3	0.74 (0.57, 0.96)
Medicaid	349	70.0	0.86 (0.61, 1.22)
Race/ethnicity within hospital type			
Nonteaching hospital			
White non-Hispanic	7133	56.0	1.0
Black non-Hispanic	801	60.3	0.99 (0.83, 1.18)
Hispanic	796	46.0	0.58 (0.49, 0.69)
Teaching hospital			
White non-Hispanic	912	81.6	1.0
Black non-Hispanic	200	74.0	0.58 (0.38, 0.87)
Hispanic	206	81.6	0.81 (0.52, 1.28)

Note. OR = odds ratio; CI = confidence interval.

^aCases for which data on any study variable was missing were excluded from this analysis (n = 1127; see Methods).

^b"Any adjuvant therapy" includes chemotherapy alone, hormonal therapy alone, or the 2 therapies together.

^cOdds ratio (OR) estimates are based on a logistic regression model that includes age, marital status, health insurance status, race/ethnicity, and hospital type race/ethnicity ($P = .01$). ORs are considered significant if the 95% confidence interval (CI) does not include 1.0.

hospital type. As a group, Hispanics have the highest proportions of uninsured persons in the United States, increasing their risk of receiving inadequate care.¹⁶ In our study, Hispanic women diagnosed in teaching hospitals were as likely as White non-Hispanic women diagnosed in teaching hospitals to receive systemic therapy. However, in nonteaching hospitals, the situation for Hispanic women was dramatically different: they were 42% less likely than White non-Hispanic women to receive systemic therapy. In contrast to Hispanic women, Black non-Hispanic women diagnosed in teaching hospitals were less likely than White non-Hispanic women diagnosed in teaching hospitals to receive combined systemic therapy.

In our sample, almost 80% of the Hispanic women were diagnosed in 3 counties, and those treated in teaching facilities were re-

ported by 3 hospitals. These results may reflect the effect of community and targeted social support resources within the teaching facilities treating these women. For example, in areas where Spanish speakers were concentrated, translators might be more readily available to Spanish-speaking women, facilitating their understanding and acceptance of adjuvant therapy. Black non-Hispanic women may not have had similar social support resources, given their lack of geographic concentration. Alternatively, the differences within teaching facilities between Hispanics and Black non-Hispanics, compared with White non-Hispanics, may reflect the fact that the Black non-Hispanic women may have had more comorbid conditions, since these women are more likely to experience toxicity,³⁴ and that these comorbid conditions may have resulted in lower use of chemotherapy.

Previous research examining the accuracy of cancer registry data found that data collected from services provided in hospitals are more complete than data from freestanding clinics or doctors' offices.^{35,36} One possible explanation for our finding that women diagnosed in teaching hospitals were more likely to receive adjuvant treatment for regional-stage breast cancer is that data from teaching hospitals may, in theory, be more complete, because chemotherapy is administered in the hospital-based clinics. However, we found no studies supporting or refuting this possibility, and because most women diagnosed in nonteaching hospitals were treated within those hospitals as well, this is an unlikely explanation.

Another possible explanation for this finding is that the teaching hospitals may indeed be providing the recommended standard of care to their breast cancer patients,^{29,37} consistent with recent reports that the mission of teaching hospitals is to be innovators and first adopters of new treatments and technologies.³⁸ This mission benefits the underserved women who are most likely to be treated in these hospitals.

Malin et al.³⁵ reviewed studies that used data from cancer registries to examine quality of treatment, and these studies found, as we did, that women treated in teaching hospitals were more likely than those treated in nonteaching hospitals to receive adjuvant therapy. Our findings about age and treatment are also consistent with those of others, in that the odds of receiving chemotherapy decreased with increasing age at diagnosis.^{6–10,31,32,39–41} With the addition of hormonal therapy, the proportion of women assigned to adjuvant therapy increased, but the associations remained the same. Our results confirmed others' observations that the use of combined therapy decreases with increasing age.^{10,31,32} Although we were not able to address comorbidity as a cause of decreased use of adjuvant therapy for regional-stage breast cancer, others have reported that age remains an independent determinant of treatment after comorbidity is accounted for.^{7,9,42}

Our study had several other limitations that may affect the interpretation of our results. First, accuracy and completeness of data decreases when women receive treatment in an

outpatient setting.^{33,35} We attempted to enrich our data by linking FCDS registry data with discharge data from hospitals and ambulatory care facilities in Florida. This linkage did not have an impact on the completeness of data on chemotherapy or hormonal therapy. In addition, we were unable to examine doctor–patient interactions or patient preferences for treatment, which are known to affect treatment decisions.^{31,42–45}

Another concern is potential misclassification of treatment outcomes because of lack of data about patients' estrogen and progesterone receptor status, since these markers predict response to hormonal therapy.^{1,2,46} Older women were more likely to receive combined therapy, consistent with the finding that older women are more likely to have estrogen receptor–positive breast cancer, which is responsive to hormonal therapy.⁴⁷ We also noted that Black non-Hispanic women had the highest likelihood of receiving chemotherapy only, consistent with reports of Black women having a higher likelihood of estrogen receptor–negative breast cancer.⁴⁸ This probably explains the smaller increase in use of “any adjuvant therapy” for Black non-Hispanic women than for White non-Hispanic women, given their expected negative estrogen receptor status.

Our results may not be generalizable to other states and other health care systems operating at the local level; multiple studies have shown significant geographic variation in medical resources and medical care (including number of specialists and number of hospitals capable of providing state-of-the-art cancer care).²⁹ Our results reflect practice patterns in Florida between July 1997 and December 2000. We used health insurance status as a proxy for socioeconomic status—an imperfect proxy at best.¹³ Given the different populations served by teaching and nonteaching facilities, our findings may be subject to residual confounding by socioeconomic factors that we were not able to measure.

Despite its limitations, our study has several strengths and adds to our knowledge of how hospital type interacts with health insurance status and race/ethnicity to influence the treatment of regional-stage breast cancer. The sample size was large enough to allow

us to make definitive conclusions about the patterns of care in a diverse population and to examine a number of potentially confounding variables. We were able to examine interactions between hospital type and health insurance status and race/ethnicity that affected the outcome of treatment for women with regional-stage breast cancer. Though health insurance is a powerful predictor of access to health care, its effect can be modified by other factors, such as whether a health care facility associated with a teaching program is available to the patient.^{11,16,26} We were able to examine teaching hospitals as a source of care, highlighting the positive impact these hospitals have on breast cancer care for medically underserved women in Florida.

Women with regional-stage breast cancer who receive adjuvant treatment after surgery and radiation therapy have better survival rates than do women who are not treated in this manner.^{3,46} Our examination of interactions between health insurance, race/ethnicity, and teaching hospitals highlights the important role teaching hospitals have in delivering treatment for regional-stage breast cancer among the uninsured, the underinsured, and minority women. Academic health centers, public and private, have assumed up to 40% of the care of uninsured persons in their communities over the last decade.²⁸ The influx of uninsured patients into teaching hospitals has occurred in communities with a high penetration of managed care organizations into the health care marketplace.^{18,28}

It is heartening to find that teaching hospitals in Florida have been able to continue to provide evidence-based care for medically underserved women. In an environment of threatened cuts to Medicaid and decreased funding to teaching hospitals, our findings provide support for maintaining or increasing funding to these health care facilities because of the significant amount of care they provide to minority, uninsured, and Medicaid-insured women that is compatible with published clinical guidelines. Ultimately, delivery of appropriate breast cancer treatment based on stage at diagnosis^{3,46} will lessen health disparities among medically underserved women. ■

About the Authors

At the time of the study, Lisa C. Richardson was with the Department of Medicine, University of Florida, Gainesville. Lili Tian is with the Department of Statistics and Abraham G. Hartzema is with the Department of Pharmacy Health Care Administration, University of Florida, Gainesville. Lydia Voti, Lora E. Fleming, and Jill MacKinnon are with the Florida Cancer Data System, Sylvester Comprehensive Cancer Center, University of Miami Miller School of Medicine, Miami, Fla. Isildinha Reis is with the Division of Biostatistics, Sylvester Comprehensive Cancer Center, and the Department of Epidemiology and Public Health, University of Miami Miller School of Medicine, Miami.

Requests for reprints should be sent to Lisa C. Richardson, MD, MPH, Division of Cancer Prevention and Control, National Center for Chronic Disease Prevention and Health Promotion, 4770 Buford Hwy, NE, Mail Stop K-55, Atlanta, GA 30341 (e-mail: lfr8@cdc.gov).

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Contributors

L. C. Richardson originated the study, obtained funding, designed the study and analyses, supervised all aspects of the study's implementation, and led the writing of the article. L. Tian assisted with the study's design and developed the analysis plan. L. Voti assisted with the creation of the analysis database and with data analyses. A. G. Hartzema assisted with the design and implementation of the study. I. Reis assisted with the data analyses. L. E. Fleming assisted with the implementation of the study and with analysis plans and contributed to the writing. J. MacKinnon assisted with the implementation of the study and creation of the analysis database. All authors participated in interpreting the results and in critically reviewing drafts of the article.

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Human Participant Protection

The Florida Department of Health and the institutional review boards of the University of Florida and the University of Miami approved the protocol for this study.

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